SWAINS LAKE

2014 SAMPLING HIGHLIGHTS

Station B

Barrington, NH

University of New Hampshire Cooperative Extension

Refer to the Swains Lake Annual Report (2014) for additional information.

Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

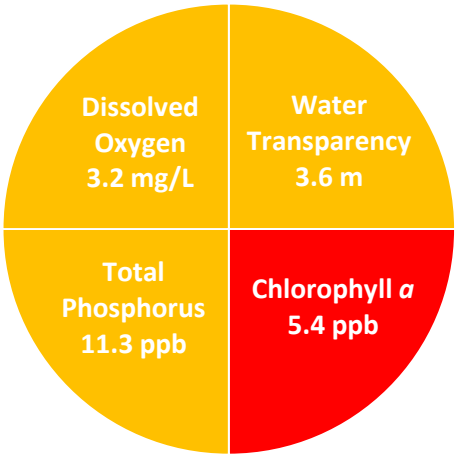


Figure 1. Swains Lake Water Quality (2014)

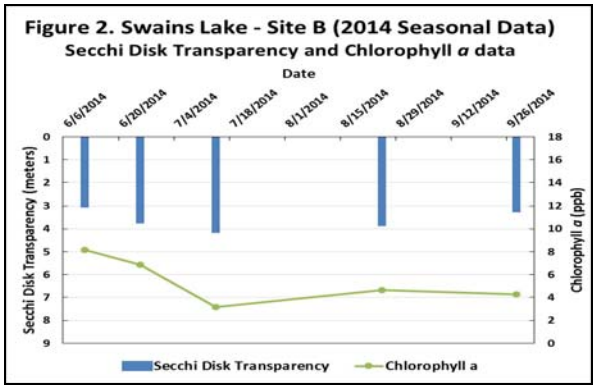
Table 1. 2014 Swains Lake Seasonal Averages and NH DES Trophic Level Classification Criteria

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Swains Lake Average (range)	Swains Lake Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	3.6 meters (3.0 – 4.1)	Mesotrophic
Chlorophyll *a* (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	5.4 ppb (3.1 – 8.1)	Eutrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	11.3 ppb (9.2 – 13.4)	Eutrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	3.2 mg/L (0.5 – 8.7)	Mesotrophic

* Dissolved oxygen concentrations were measured on June 25, 2014 between 4.0 and 7.5 meters, in the layer of rapidly decreasing temperatures.

Table 2. 2014 Swains Lake Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Swains Lake Average (range)	Swains Lake Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	29.5 color units (19.3 – 36.2)	Lightly tea colored
Alkalinity (mg/L)	< 0.0 acidified	0.1 – 2.0 extremely vulnerable	2.1 – 10 moderately vulnerable	10.1 – 25.0 low vulnerability	> 25.0 not vulnerable	3.5 mg/L (3.1 – 3.8)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			6.3 standard units (6.1 – 6.4)	Tolerable range for fish growth and reproduction
Specific Conductivity (*u*S/cm)	< 50 *u*S/cm Characteristic of minimally impacted NH lakes		50-100 *u*S/cm Lakes with some human influence	> 100 *u*S/cm Characteristic of lakes experiencing human disturbances		105.0 *u*S/cm (104.7– 105.4)	Characteristic of lakes experiencing human disturbances



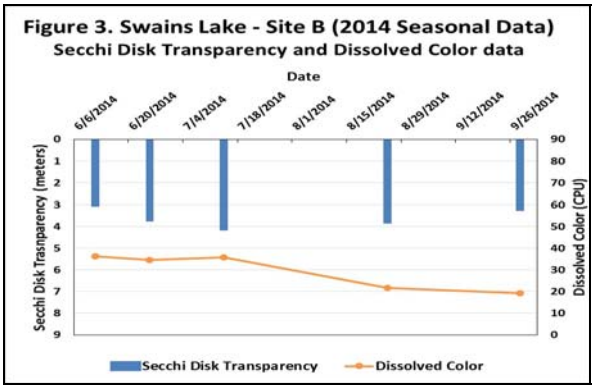


Figure 2 and 3. Seasonal Secchi disk transparency, chlorophyll *a* changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll *a* and/or color concentrations.

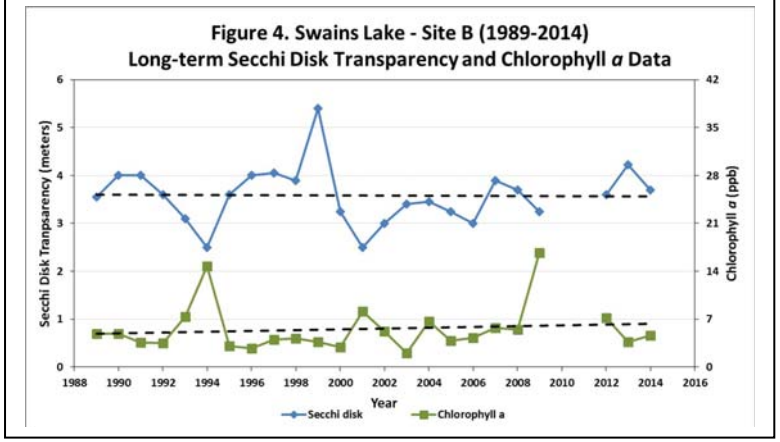
LONG-TERM TRENDS

WATER CLARITY: The Swains Lake water clarity measurements, measured as Secchi Disk transparency, have oscillated among years while the long-term water clarity is stable (Figure 4).

CHLOROPHYLL: The Swains Lake chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, display a trend of increasing concentrations (Figure 4).

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. The Swains Lake total phosphorus concentrations display a trend of increasing concentrations (Figure 5).

COLOR: The Swains Lake color data, the result of naturally occurring "tea" color substances from the breakdown of soils and plant materials, display a trend of increasing concentrations (Figure 5).



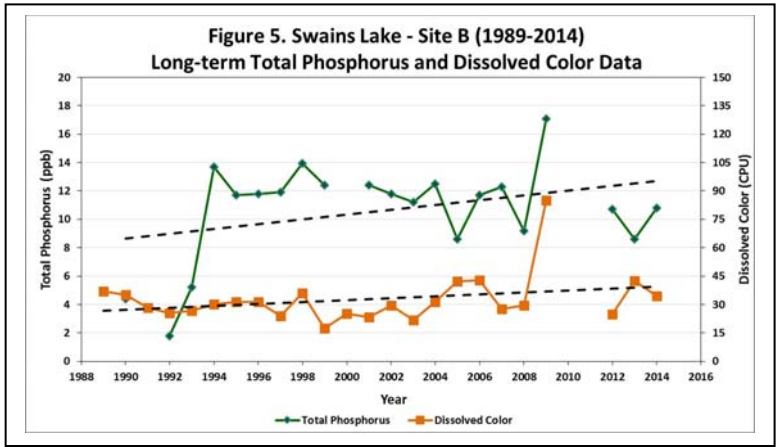


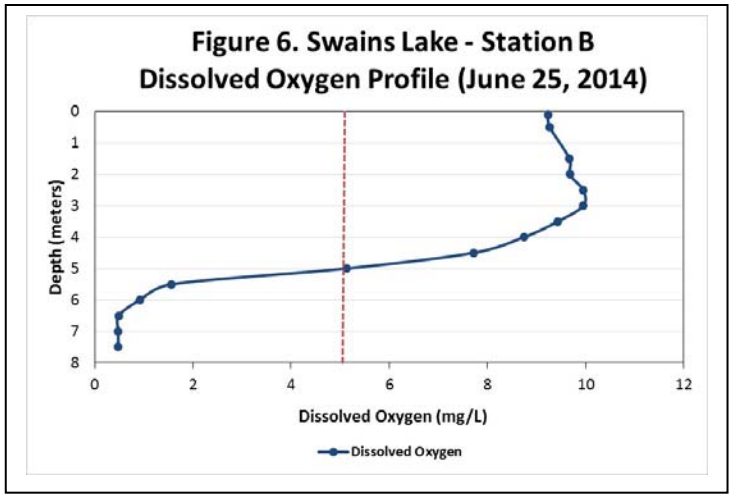
Table 3. Swains Lake Seasonal Average Water Quality Inter-site Comparison (2014)

Site	Average Secchi Disk Transparency (meters)	Average Chlorophyll *a* (ppb)	Average Total Phosphorus (ppb)	Average Dissolved Oxygen (ppm)
Station A	3.3	6.5	12.4	4.1
Station B	3.6	5.4	11.3	3.2

- Dissolved oxygen measurements were taken late season (early-mid September) and from the bottom water layer (hypolimnion).
- Dissolved oxygen data are reported for the mid-lake layer (metalimnion).

Figures 4 and 5. Changes in the Swains Lake water clarity (Secchi Disk depth), chlorophyll *a*, dissolved color and total phosphorus concentrations measured between 1989 and 2014. **These data illustrate the relationship among plant growth, water color and water clarity. Total phopshorus data are also displayed and are oftentimes correlated with the amount of plant growth.**

Figure 6. June 25, 2014 Swains Lake dissolved oxygen profile. The vertical red line indicates the oxygen concentration commonly considered the threshold for successful growth and reproduction of cold water fish. *Notice the low oxygen concentations near the lake bottom.*



Recommendations

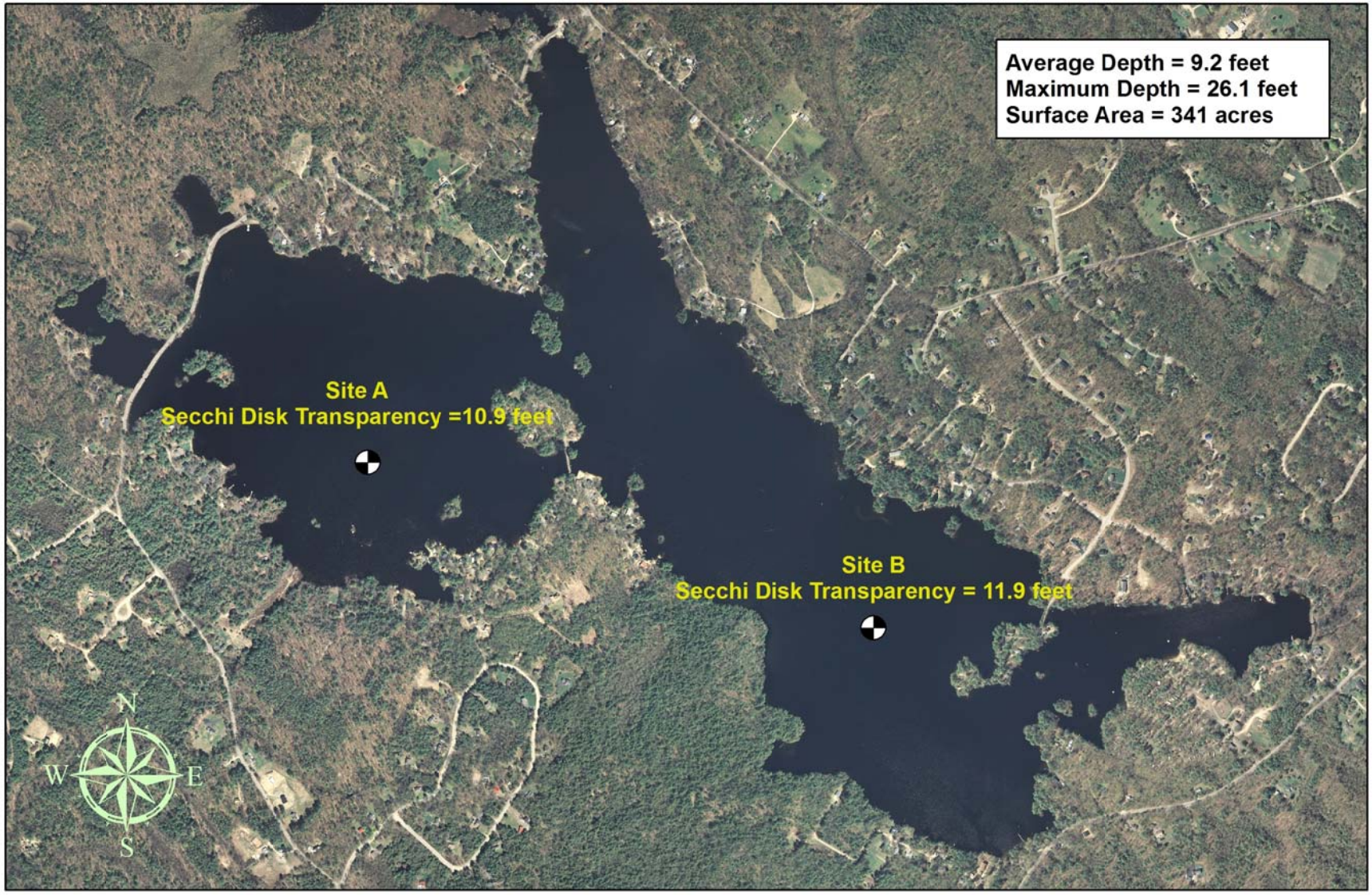
Implement Best Management Practices within the Swains Lake watershed to minimize the adverse impacts of polluted runoff and erosion into Swains Lake. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home" for more information on how to reduce nutrient loading caused by overland run-off.

- http://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf
- http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf

Figure 7. Swains Lake

Barrington, NH

2014 deep water sampling stations and seasonal average water clarity



Aerial Orthophoto Source: NH GRANIT
Site locations GPSed by the UNH Center of Freshwater Biology

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